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13. ABSTRACT ***(Maximum 200 Words)***
THE BATTLE COMMAN REENGINEERING II (BCR II) EXPERIMENT WAS CONDUCTED AT THE MOUNTED WARFARE TEST BED (MWTB) AT FORT KNOX, KY, FROM JUNE 10 TO JUNE 17, 1998. THE EXPERIMENT WAS PERFORMED AS DELIVERY ORDER (DO) #72 UNDER THE LOCKHEED MARTIN ADVANCED DISTRIBUTED SIMULATION TECHNOLOGY (ADST II) CONTRACT ADMINISTERED BY THE U.S. ARMY SIMULATION, TRAINING, AND INSTRUMENTATION COMMAND (STRICOM). THE EXPERIMENT WAS SPONSORED BY THE TRAINING AND DOCTRINE COMMAND'S (TRADOC'S) MOUNTED MANEUVER BATTLE LAB (MMBL), FORT KNOX, KY. THE EXPERIMENT UTILIZED A SYNTHETIC ENVIRONMENT THAT EMPLOYED VIRTUAL SIMULATIONS TO DEPICT A HEAVY TASK FORCE EXECUTING THREE BASIC TASK FORCE-LEVEL SCENARIOS IN REALISTIC COMBAT SITUATIONS IN VARIOUS EXPERIMENTAL CONFIGURATIONS. THE SCENARIOS WERE DEVELOPED TO BE EXECUTED ON THE SYNTHETIC THEATER OF WAR-EUROPE (STOW-E) TERRAIN DATABASE. THE SCENARIOS INCLUDED MOVEMENT TO ENGAGE VIGNETTES. THESE SCENARIOS WERE DESIGNED TO PRODUCE EFFECTIVE OPERATIONS ORDERS AND CONCEPTS, AND INDUCE THE COMMANDERS AND THEIR PLANNING STAFF TO MAKE TACTICAL DECISIONS THAT AFFECTED BATTLE OUTCOMES.

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FINAL REPORT

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EXECUTIVE SUMMARY

Background

The Battle Command Reengineering II (BCR II) Experiment was conducted at the Mounted Warfare Test Bed (MWTB) at Fort Knox, KY, from June 10 to June 17, 1998. The experiment was performed as Delivery Order (DO) #72 under the Lockheed Martin Advanced Distributed Simulation Technology II (ADST II) Contract administered by the U.S. Army Simulation, Training, and Instrumentation Command (STRICOM). The experiment was sponsored by the Training and Doctrine Command's (TRADOC's) Mounted Maneuver Battle Lab (MMBL), Fort Knox, KY. The experiment utilized a synthetic environment that employed virtual simulations to depict a heavy Task Force executing three basic Task Force-level scenarios in realistic combat situations in various experimental configurations. The scenarios were developed to be executed on the Synthetic Theater of War-Europe (STOW-E) terrain database. The scenarios included Movement to Engage vignettes. These scenarios were designed to produce effective operations orders and concepts, and induce the commanders and their planning staff to make tactical decisions that affected battle outcomes.

Related Efforts Under ADST II

A phase I experiment, focused on Tactical Operations Center (TOC) Concept Experimentation Program (CEP), was conducted during December 1997 at the MWTB. This effort was conducted as DO #60. The purpose of this experiment was to optimize the configuration of the future TOC based upon helping the commander to visualize the battlefield and enhance the timeliness and accuracy of the information provided to him in his or her command group environment. After that experiment, a series of follow-on experiments was planned at six month intervals to focus and evolve battle command requirements and objectives for the far term and Army After Next (AAN). BCR II was the first of these follow-on efforts.

The objectives of this effort were:

1) To further refine requirements of the Battle Command as it relates to the Battalion Commander, the staff, and the digital system capabilities that might be available in 2010.

2) To demonstrate functional capabilities that are useful to the Commander and his staff and facilitate the cognitive process and decision making associated with Battle Command.

Development of the software modifications to Modular Semi-Automated Forces (ModSAF) and modifications to Image Generator (IG) vehicle models took place at both the Operational Support Facility (OSF) in Orlando, FL and the MWTB. The final integration phase was completed at the MWTB from May 18 to June 5, 1998.

The experiment's test trial window was six (6) days. The trial runs were completed within the allocated time.

In accordance with the Government Statement of Work (SOW), this Final Report includes a description of the experiment, its conditions and conduct, and lessons learned. This report addresses the interconnectivity of simulation systems, modifications to both ModSAF and the manned simulators, and the integration of Government Furnished software models. This report does not include discussion of data analysis nor conclusions as to whether the customer(s) achieved their objectives of the experiment.

1. Introduction

1.1 Purpose

The purpose of this final report is to document the ADST II effort that supported BCR II. This report includes a full description of the experiment, its architectural design, its conditions, and lessons learned.

1.2 Contract Overview

BCR II was performed, as DO #0072 under the Lockheed Martin Corporation (LMC) ADST II contract with STRICOM. The contract, a Unilateral Delivery Order, required LMC to analyze the technical and experimental architecture of the experiment, provide support in the development of training and test scenarios, configure and integrate the MWTB and TRADOC Brigade & Below Virtual Battlefield (TB2VB) assets for the experiment, and assist in data reduction.

1.3 Experiment Overview

The purpose of BCR II was to use man-in-the loop simulators, vehicle mockups, and simulated forces to: further refine requirements of Battle Command as it relates to the Battalion Commander, the staff, and the digital system capabilities that might be available in 2010; demonstrate functional capabilities that are useful to the Commander and his staff; and facilitate the cognitive process and decision making associated with Battle Command. The experiment employed two manned simulators, three reconfigurable simulators, and five desktop simulators. The two manned simulators were Staff Operations Vehicle (SOV) mockups configured as future and current Operations SOVs. These SOVs were variants of the C2Vs used in the previous experiment, TOC CEP. The three reconfigurable simulators. Two of them were Advanced Research Projects Agency (ARPA) Reconfigurable Simulator Initiative (ARSI) Simulators built by Texas Instruments/Raytheon. One was on loan from Project Manager Advanced Tank Armament Systems and configured as a Future Scout Cavalry System platform, and one is a TB2VB resource and was configured as the Battalion Commander's Battle Command Vehicle (BCV). The third reconfigurable simulator is a recent delivery to the TB2VB from Lockheed Martin Vought as a result of an Advance Concepts Technology II (ACT II) program. It was configured as a Future Scout Cavalry System (FSCS) concept platform. In addition to the manned simulators, the artillery battery commander, the BCV wingman tanks, and the deputy commander used desktop simulators. A Brigade white cell was also played in an adjacent room.

The desktops and simulators were augmented with role players and ModSAF to depict a heavy Task Force that conducted tactical operations against a doctrinally approved and depicted Opposing Force (OPFOR) ModSAF threat.

1.4 Technical Overview

The technical approach to BCR II involved the analysis of the past experiment, analysis of new requirements for this experiment, development of software, and the configuration and integration the MWTB and TBV2B assets into the experiment configuration.

Software development was conducted primarily on-site at the MWTB, with additional work conducted at the Operational Support Facility (OSF). Development of the software was conducted in a "rapid prototyping" or "spiral development" manner, with multiple "code, test, fix/change" iterations in order to meet the customer's requirements. Once the synthetic environment functional tests were completed, Fort Knox conducted troop training and a Pilot Test. After the Pilot Test was

completed, approval was obtained to start the experiment.

2. Applicable Documents

2.1 Government

-ADST II Work Statement for Battle Command Reengineering II (BCR II), February 23, 1998, AMSTI-98-WO18

2.2 Non-Government

3. System Description

3.1 System Configuration and Layout

The MWTB contains a variety of simulators, networks, ModSAF capabilities, displays for monitoring the battlefield, utilities to facilitate exercises, and automated data collection, reduction, and analysis capabilities. Paragraphs 3.2.1 through 3.2.15 discuss the description, functionality and operation of the system components, which includes the Government Furnished Equipment (GFE) models and their integration with the hardware at the MWTB. The BCR II Network is depicted in Figure 1.

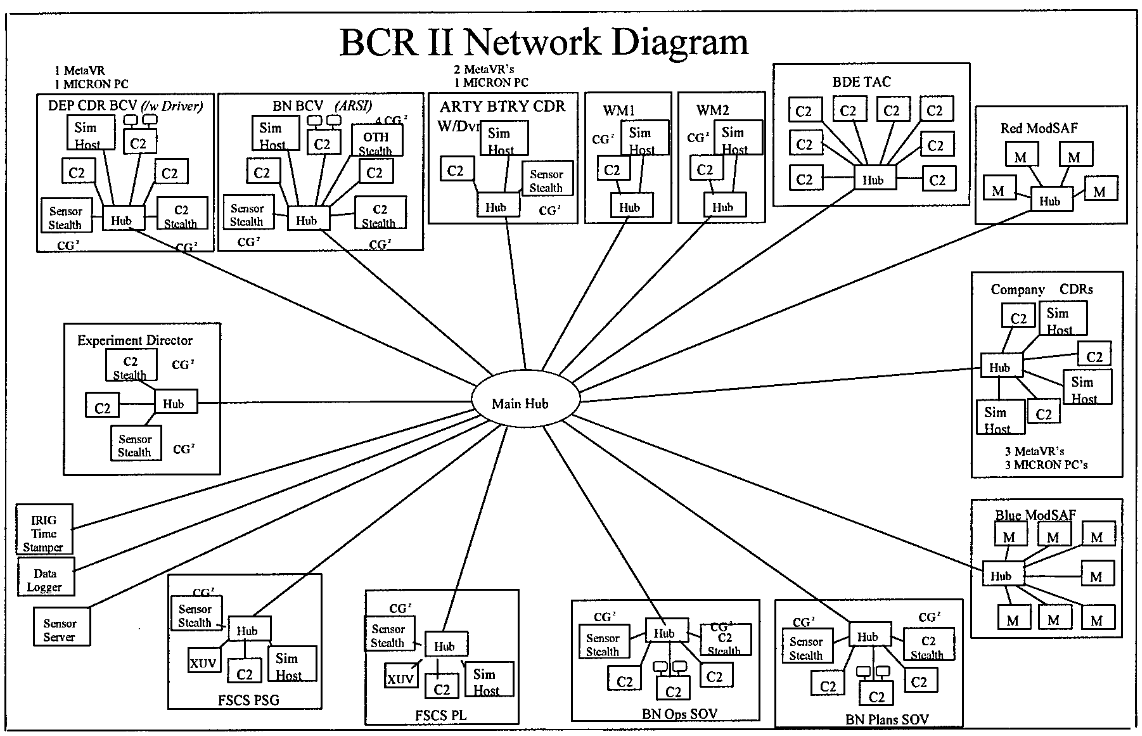


Figure 1 BCR II Network Diagram

The experiment was conducted using assets interconnected on Ethernet LANs via twisted pair cable. Simulation assets used Distributed Interactive Simulation (DIS) 2.03 protocol. Table 1 lists assets used at the MWTB/TB2VB.

ADST II/TB2VB ASSETS	PURPOSE	PROTOCOL
Two Command and Control Vehicle (C2V) Mockup	Task Force and Brigade Tactical Command Posts (SOVs for Battalion OPS & PLANS)	DIS 2.03
Reconfigurable Simulators (Two ASRI and one ACT II)	Battalion BCV (ARSI) & Future Scout Simulators for two Scout Platoon Leaders.	DIS 2.03
Stealth	Battlefield Visualization Display for Commander Role-player	DIS 2.03
ModSAF Workstations	Semi-Automated Forces for BLUFOR and OPFOR	DIS 2.03
Desktop Simulators	Used for Company Commanders, Artillery, Wingman positions, Deputy Commander BCV Driver's Station	DIS 2.03
ASTi Radio Simulator	Simulated Radio Communications	DIS 2.03
Plan View Display	Terrain Map of the battlefield for Exercise Control (simulated C2 display)	DIS 2.03
Data Loggers	Record of DIS PDUs for Data Collection & Analysis	DIS 2.03
DIS Time Stamper	Time Stamp of DIS PDUs for Data Collection & Analysis	DIS 2.03

Table 1 ADST II /TB2VB Assets

In addition to the manned simulators and assets listed in Table 1 above, there were eleven SGI workstations, twenty-four Sun workstations, and four SUN Ultras, five MetaVR Stealth Machines, eighteen CG^2 Sensor Stealth Intergraph Machines (nine were purchased by the MMBL and nine were on loan), four thirty-seven inch monitors, one twenty inch flat panel, and four LCD projectors required to support the experiment. Figure 2 depicts the BCR II Floor Plan Layout.

Communications were primarily conducted over ASTi radio simulators. The ASTi inventory consisted of six Digital Aural-cue/Communications System (DACS), 12 Remote Interface Units (RIU), 27 Crew Access Units (CAU), five Hand Held Terminals (HHT), four Radio Control Units (RCU) and 36 headsets. Figures 3 and 4 depict the BCR II Floor Plan with Radio Assets and the BCR II Floor Plan with Radio Terminal Locations.

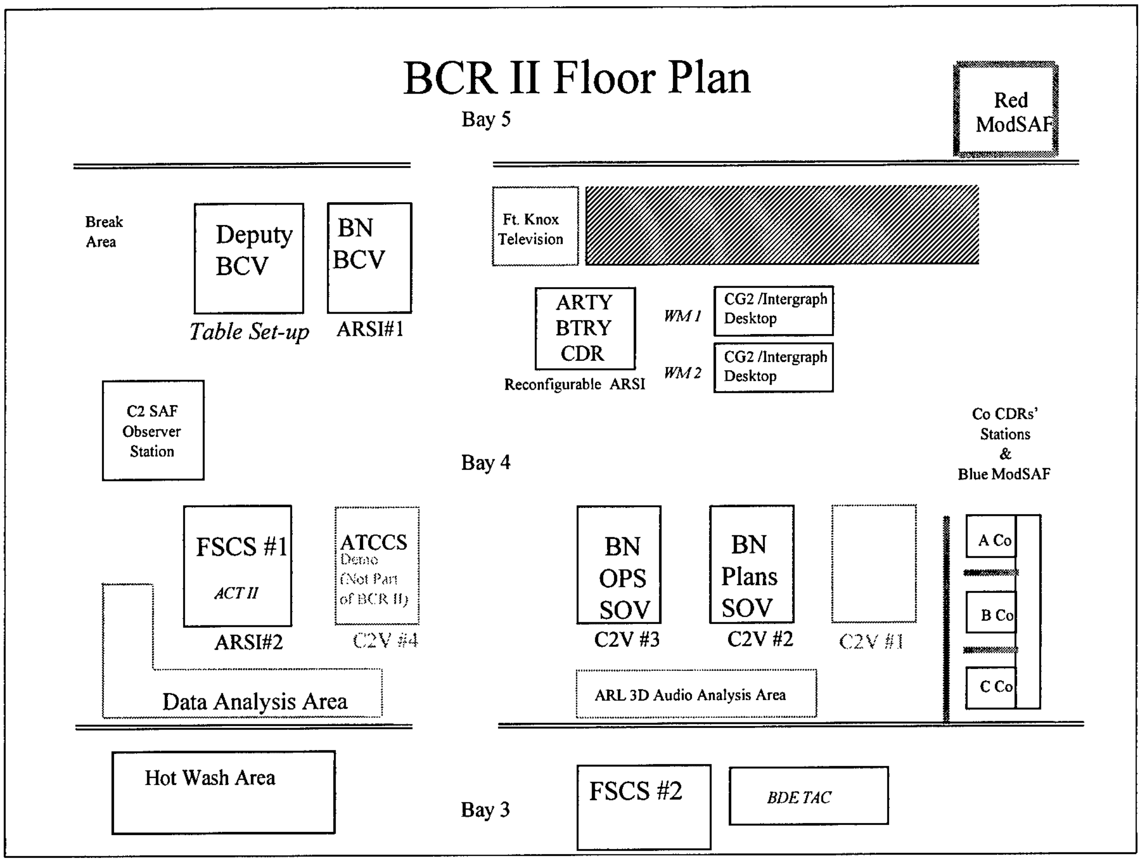


Figure 2 BCR II Floor Plan Layout

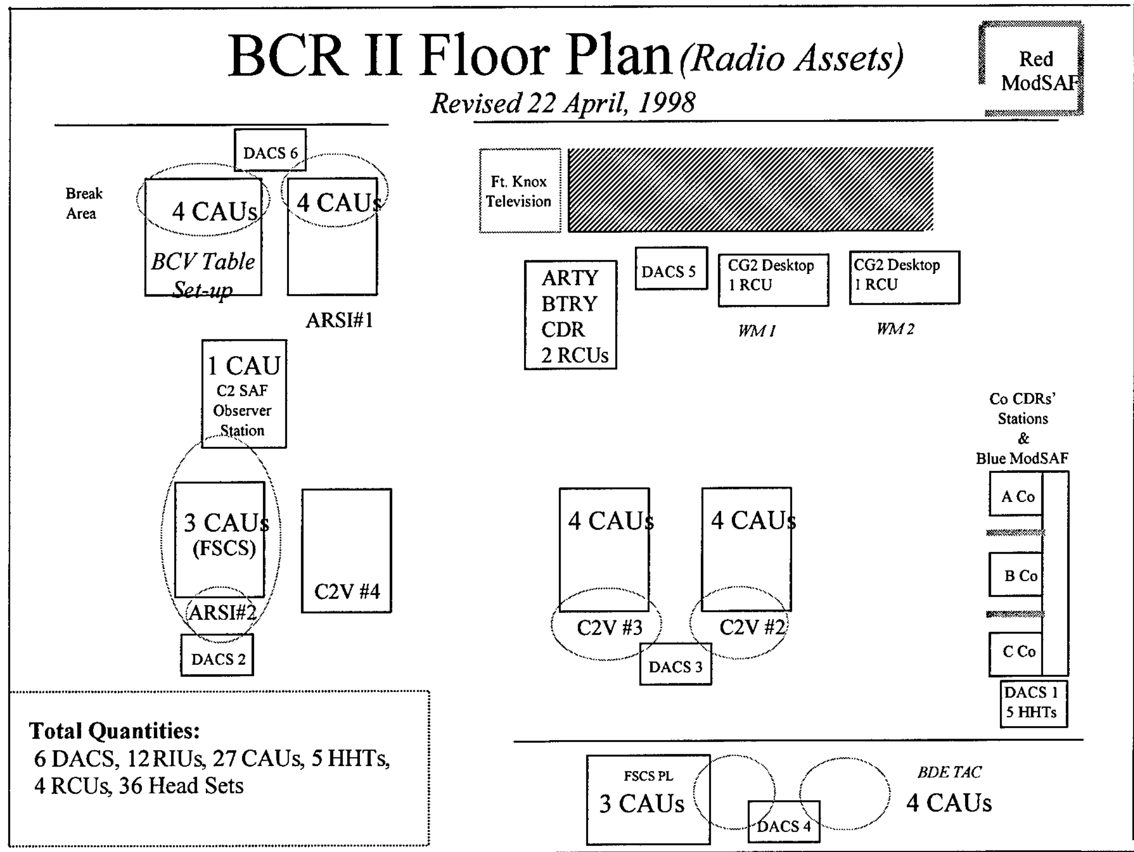


Figure 3 BCR II Floor Plan with Radio Assets

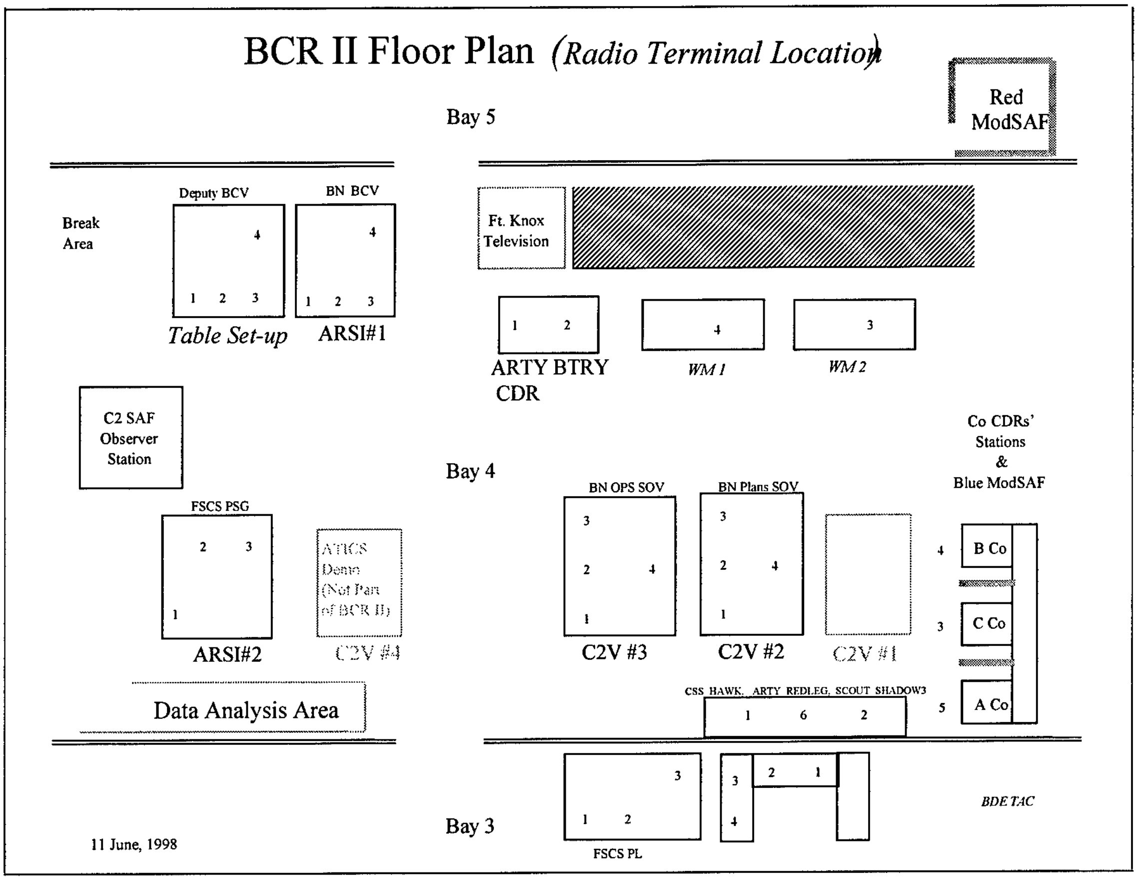


Figure 4 BCR II Floor Plan with Radio Terminal Locations

3.2 Description of System Components

3.2.1 Surrogate Command, Control, Computer and Communications (SC4)

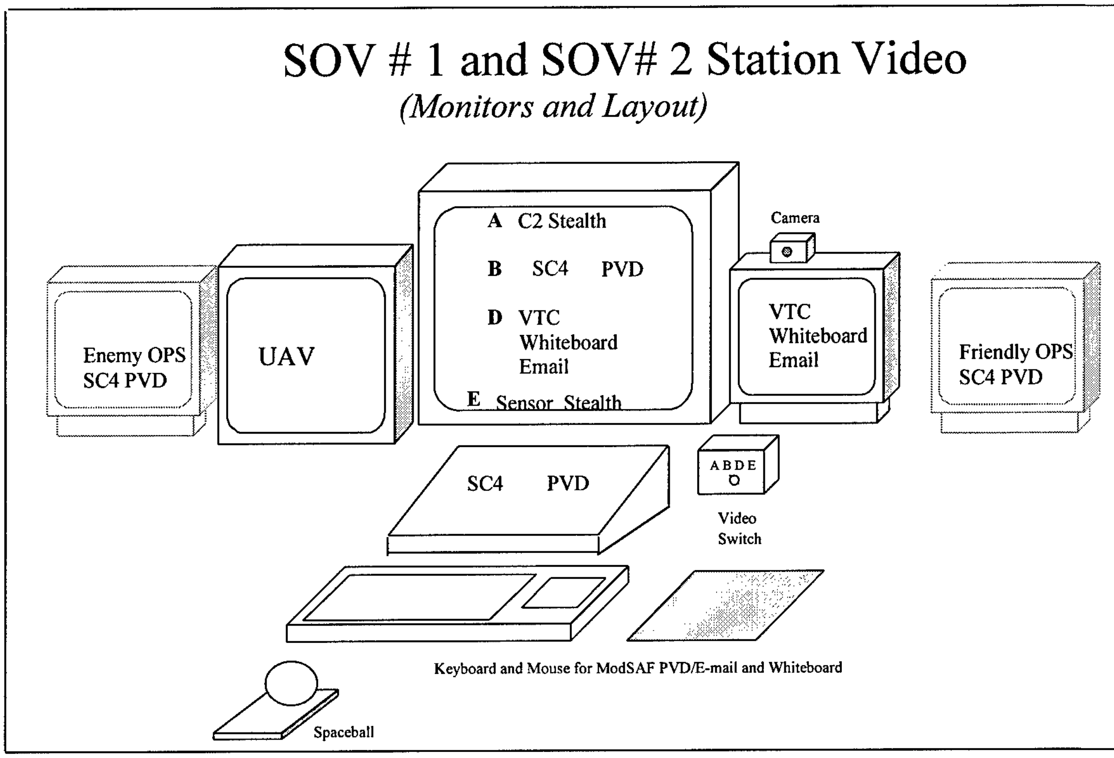
Due to the future timeframe of the technologies being examined for BCR II, use of the current generation C4 systems in the experiment would not suffice. Therefore, a surrogate next generation C4 system was created through the use of ModSAF code. The ModSAF Plan View Display (PVD) was altered and enhanced to serve as the display system of this notional C4 system. Additional reporting capabilities, menus, operations, etc. were added to simulate a complete C4 display system. This experimental system, referred to as "Surrogate C4," was used to examine the optimum information presentation/mix to the Commanders. (The reader is cautioned to note that Surrogate C4 is not a SAF system, which plays C4 messaging, and functionality, but rather is an implementation/reuse of ModSAF code in order to simulate a C4 system.)

3.2.2 Staff Operations Vehicle (SOV) #1 and #2

The SOV mockup replicates a Staff Operations Vehicle for various echelons of command and is configured on a Multiple Launch Rocket System (MLRS) chassis. These are variants of the C2V Mockups used in TOC CEP (DO #60). Both the SOV #1 and #2 were configured in a similar fashion. MWTB/TB2VB C2V Mockups #2 & #3 were modified and used for the Battalion Plans and Operations SOVs. Each of the SOVs had a four-man crew. The four-man crew consisted of two

officers and two noncommissioned officers. Each of these vehicles had an officer in charge (OIC) positioned in the center of the vehicle in front of a simulated flat panel display (large screen monitor). Two additional operations personnel flanked the OIC. The individual on the right monitored the friendly operations and the individual on the left monitored the enemy operations. Another officer was positioned to the rear of the OIC and monitored and controlled an Unmanned Aerial Vehicle (UAV). A video feed of the UAV view was also provided to the commander. The video monitoring capability for SOV #1 and SOV #2 is depicted in Figure 5.

The purpose of the two SOVs was to have one control and monitor the current tactical operation (OPS) and the other start the planning (PLANS) for future operations. When the current operation was complete and the planning for the follow-on operation was complete, a transition between the two vehicles took place. This allowed for the second SOV to start the control for the next operation (which it had planned), and the original SOV (which completed the operational control of the previous mission) would revert to planning the next operation. These two vehicles would continue to alternate between controlling the current operation to the planning of the future operation.



VIDEOB1.PPT

Figure 5 **Current and Future OPS SOV Station Video**

3.2.3 Battle Command Vehicle

The Task Force Commander and Deputy Commander used a BCV. The ARSI Simulator was configured to replicate the Task Force Commander's BCV, which was used for command and control of the Task Force. This vehicle was configured with a driver in the hull and with a crew of three in the crew compartment. The commander is centered in the center in front of a simulated flat panel display, and is flanked on both sides with two operations officers that provide similar functionality as the crew of the SOV. Additionally, a simulated open hatch view was provided for the commander on

top of the simulator via three overhead projectors and screens. The Deputy Commander's BCV was set up on tables and used a desktop simulator for the driver's station. Other than not having an open hatch display, the Deputy commander's BCV had the same capabilities and functionality as the Battalion Commander's BCV. From this simulator the Task Force Commander analyzed information provided by the SOV and directed the company commanders in his task force. The commander's station video monitoring capability is depicted in Figure 6.

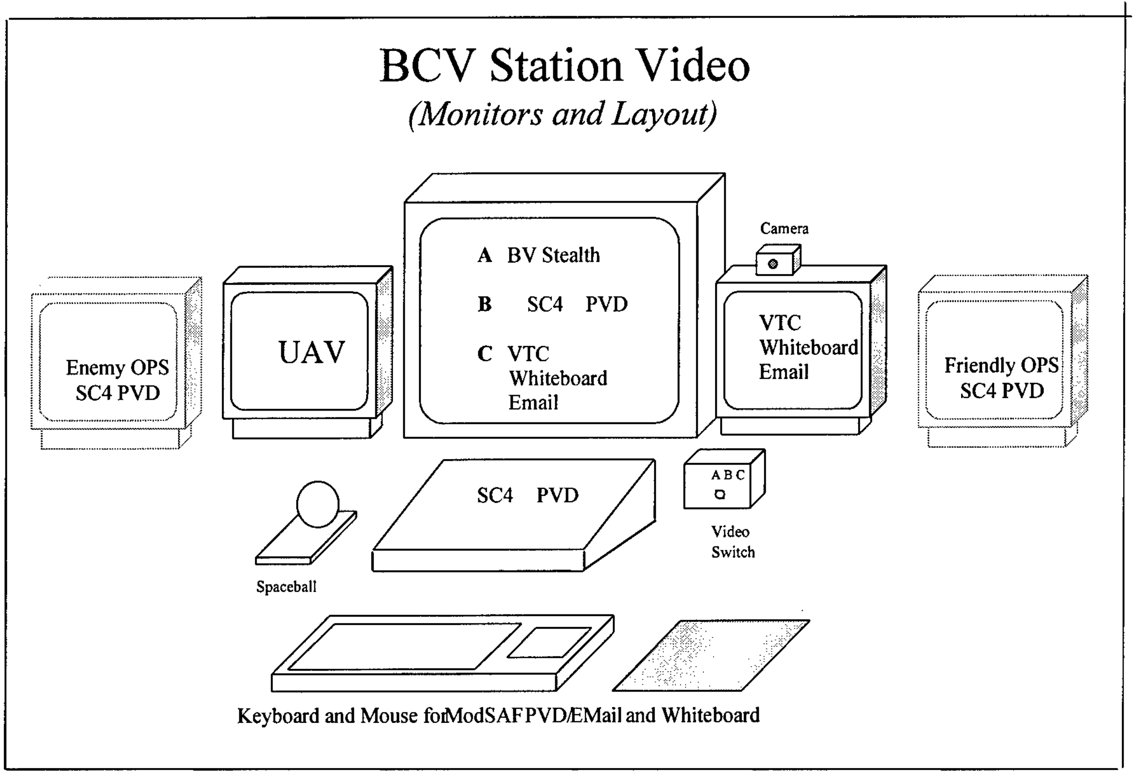


Figure 6 BCV Station Video

3.2.4 Battle Command Vehicle Security Sections

Security for each of the BCVs was provided by a two tank, tank section. In each section, one tank was played using a CG2/Integraph desktop simulator with a vehicle commander and driver (referred to as Wingman 1 and 2 in Figures 1 and 4), and one tank was replicated in ModSAF on SGI Indy workstations.

3.2.5 Company Commander's Stations

Three company commanders participated in the exercise. These commanders operated SC4 SUN workstations and controlled their subordinate platoons, which were replicated in ModSAF on SGI Indy workstations. Each company commander was also operating a TASC driver simulator with a MetaVR image generator to provide an out-the-window (OTW) view of the virtual battlefield. This allowed the company commanders to relocate themselves on the battlefield.

3.2.6 Artillery Station

The Artillery Battery Commander participated in the exercise. This commander operated a SC4 SUN workstation and controlled his subordinate platoons and Advanced Fire Support system, which were replicated in ModSAF on SGI Indy workstations. This station also had a TASC driver simulator with a MetaVR image generator to provide an OTW view of the virtual battlefield. This allowed the artillery players to relocate themselves on the battlefield.

3.2.7 Future Scout Cavalry System (FSCS) Simulators

Scout and reconnaissance functions were played on two reconfigurable simulators. These vehicles were also equipped with the Next Generation Experimental Vehicle software, which played a robotics vehicle. One TI/Raytheon ARSI and one Lockheed Martin Vought reconfigurable simulator were used to play the two FSCS vehicles.

3.2.8 Sensor Server

The sensor server was a SUN Sparc 20 workstation. It was running modified ModSAF 3.0 software that would receive DIS 2.03 data packets on User Datagram Protocol (UDP) port 3000 (real world) and pass them to UDP port 3010 (sensed world) if they were friendly entities or enemy entities that had been sensed by blue intelligence. This provided the ability to take a "standard" simulation tool, such as a Stealth or ModSAF PVD, and use it as a more enhanced C2 system, displaying Blue Forces (BLUFOR) situation awareness (SA) as well as sensed/detected OPFOR. Real world and sensed world used the same physical network.

3.2.9 ModSAF Operations

Workstations used to generate ModSAF entities were connected to Network Port 3000, and workstations used for Surrogate C4 (simulated C4 system display) were connected to Network Port 3010. A variant of ModSAF 4.0 developed under the Next Generation Reconnaissance & Experimental Unmanned Vehicle (NGR&XUV) ADST II DO (#73) was used in the scout vehicles for control of the robot.

Twenty-one ModSAF workstations were used in the experiment. Seven workstations were used for Blue ModSAF, four workstations were used for Red ModSAF, four workstations were used for scouts, two workstations were used for artillery, two workstations were used for wingmen, one workstation was used for engineers, and one workstation was used for combat service support.

A ModSAF Version Description Document (VDD) will be published to depict the modifications to the ModSAF software. The VDD document number is ADST-II-CDRL-BCR-9800209.

3.2.10 Data Logger

The Data Logger is an ADST II asset that captures the network traffic and places the data packets on a disk or tape file. The Data Logger performs the following functions:

a. Packet Recording - Receives packets from the DIS network time stamps and then writes to a disk or tape.

b. Packet Playback - Packets from a recorded exercise can be transmitted in real time or faster than real time. The Data Logger can also suspend playback (freeze time) and skip backward or forward to a designated point in time. The logger can be controlled directly from the keyboard or remotely from the Plan View Display (PVD). Playback

is visible to any device on the network (PVD, Stealth Vehicle, a vehicle simulator, etc.).

c. Copying or Converting - Files are copied to another file, which can be on the same or a different medium; and files from the older version of the Data Logger can be converted to a format compatible with the current version of the Data Logger.

For the BCR II experiment four data loggers were employed to capture the exercise. Two for the DIS LAN and the other two for the radio network. For the logging on the radio network a Sun Sparc 20 with 128 MB RAM, with total hard disk storage of 9GB utilizing the Solaris 2.5 operating system was used. For backup a Sun IPX systems with 48 MB RAM, 1 GB Hard drive Sun utilizing the Sun OS 4.1.3 operating system was used.

For the logging on the main simulation network a Sun Sparc 10 with 128 MB RAM, with total hard disk storage of 9GB with the Solaris 2.5 operating system was used. For backup, a Sun Ultra 1 with Solaris 2.5, 128 MB RAM, and total hard disk storage of 9GB was used.

3.2.11 Time Stamper

The MWTB provided a Time Stamper that consisted of a time code generator (clock); an IBM-compatible Personal Computer (PC) loaded with the MS-DOS operating system, as well as a coaxial cable connecting the two units. This time code generator produced time data in days, since 1 January, in hour/min/sec/1/1000 second in IRIG B format. The PC runs a program that reads the IRIG B time signals and converts them into time data to be sent out as a DIS 2.03 time stamp PDU once a minute. The DIS Logger receives the time stamp in PDUs and adjusts its internal clock accordingly. The DIS PDUs on the simulation network are then tagged with this time as they are sequentially received by the DIS Logger.

In the BCR II experiment a second Time Stamper PC attached to same clock was used to time stamp the DIS logger that captured the radio and signal PDUs. This allows perfect correlation of the data sets logged on both loggers.

In addition, a video time inserter attached to the same clock was used to tag the video recorded over the shoulder of the crewmen.

3.2.12 SC4 Stealth System

CG^2 – Intergraph software hardware sets were used to provide a surrogate battlefield visualization tool and to replicate sensor feeds (TUAV, XUV, satellite) as a part of the SC4 Stealth System. The Stealth used as a battlefield visualization tool permits the controller to fly around the virtual battlefield and view the simulation without interfering with the action.

The features of the Stealth allow the observer to survey the virtual battlefield from a variety of different perspectives. The intent of the Stealths located in the C2Vs and BCVs for BCR II was to provide the commanders with a virtual representation of the battlefield. This notional system would use a Synthetic Natural Environment (SNE) terrain database of the actual battlefield area, and would populate it with entities (vehicles, etc.) based on data from the sensed world. The sensed world systems supplying this data would include items such as: locations of friendly forces via SA messages (from blue C4 devices); locations of enemy forces based on reports from blue C4 devices; locations of enemy forces based on data from friendly sensing platforms (i.e., UAVs, Electro Optical, and Side Aperture Radar satellite imagery etc.); and others. This notional visualization system was simulated by connecting a Stealth to the "sensed" network, thereby allowing the stealth to function as normal, with no modifications, yet only display what the Sensor Server had decided was "sensed" in the battlefield.

The sensor feed was simulated by connecting a separate Stealth to the "real world" network, and allowing the operator to select the feed source (TUAV, XUV, and satellite), The operator could only select a valid feed source. They could not just "fly" around the world and obtain additional information. The view displayed was based on the source as far as FOV, perspective, panning and zooming capabilities.

In addition to the Test Director station, four vehicles were equipped with C2 Stealths; the BCVs (ARSI BCV and table setup BCV), C2V #2 (SOV#1) and C2V #3 (SOV#2). Their military functions were BN BCV, XO (Deputy CMDRs) BCV, BN OPS and BN PLANS.

Intergraph PCs running the CG^2 Vtree visual software used as a platform for the C2 Stealth. The 3D image was viewed on a 37-inch (1024x768) Mitsubishi Monitor at the commander's station. The monitor was positioned so that its backend protruded through the C2V's wall, in order to more realistically simulate a flat panel display's space claim. An off-the-shelf Spaceorb was placed on the commander's desk, allowing him to search the virtual battlefield in free fly mode, assess battle situations, and plan actions.

3.2.13 DIS LAN Network Configuration

A DIS LAN configuration was used with 10 BaseT standard cable. All workstations, simulators and image generators on the main simulation network were connected to a Cabletron MMAC plus, providing true 10Mb/s bandwidth to each port.

Due to a very high entity count and additionally high bandwidth requirements of the Surrogate C4 machines running whiteboard, it was necessary to split the physical network. The radio DIS LAN was isolated from the rest of the network.

In addition, an ISDN line with 128 kb/s bandwidth and a 1.5 Mb/s T1 line connected the DIS LAN to the U.S. Army Space Command in Huntsville, AL. This allowed the commander in each vehicle to request and receive satellite imagery.

3.2.14 Satellite Imagery Communications

The experiment used two types of satellite imagery. Side Aperture Radar (SAR) was a photo image that appeared on the whiteboards after a user requested the image by e-mail. This request was processed by the players at the MWTB and relayed to Huntsville by the ISDN line.

The second form of satellite imagery was Electro Optical (EO). This appeared as a stealth image on the UAV stealth upon request. The stealth operator had to select EO from the operator's menu, define the area for the image, and then the request was processed and relayed to Huntsville by the ISDN line as described above.

3.2.15 DIS Radio Communications

DIS radio communications were primarily conducted using various configurations of the ASTi Digital Aural-cue/Communications Systems (DACS) integrated with various types of radio controllers such as Crew Access Units (CAUs), Radio Control Units (RCUs), and hand-held terminals (HHTs). The individual locations of the radio controllers are depicted in Figure 3.

During the previous TOC CEP experiment, it was noticed that the data collection of radio transmission data only permitted identification to the vehicle (BCV or C2V) level and not to the individual operator level since the radios within the particular vehicle is shared. To correct this problem, a special radio instrumentation PDU was developed for each of the DACS, which permits

each operator's radio transmissions to be identified. The special radio instrumentation PDU is broadcast every two seconds and is identified as PDU type 190 (BE hex). The PDU layout, as shown in Appendix A, consists of 100 bytes of information, which includes the Ethernet, IP, UDP, and DIS header information.

3.3 Database and Scenario Development

The existing ADST II STOW-E Compact Terrain Database 7 (CTDB7) (ModSAF) terrain database was used to support the experiment. Three test scenarios and two training scenarios were developed to support BCR II. Scenarios depicted a Task Force conducting Movement to Engage operations. The scenarios included Operations Orders (OPORD), Fragmentary Orders (FRAGOs) and overlays to support the mission. The Mounted Maneuver Battle Lab and ADST II Lockheed Martin Services Group (LMSG) MWTB personnel developed the orders and overlays.

3.3.1 IG Visual Models

The BCR II experiment used open flight compliant image generators. There were three different software sets on the various image generators. Because no legacy image generators were used and due to a lack of existing 3D models for both current and concept platforms, a large amount of work was done to convert applicable legacy models, correct deficiencies in the existing STOW-E flight format file, create new 3D models, and load into the three different software sets.

Problems identified with the STWO-E flight format file were corrected by the Topographic Engineering Center (TEC). These problems were identified during the initial integration and are a function of the age of the existing file. The file was developed using older software sets. There was a difference in the three software sets (which were based on a second-generation protocol) that required some significant changes to be made by TEC in the flight format terrain database. There are still a number of refinements that could and should be made to the STOW-E flight format file to maximize current image generation capabilities.

Another problem for some of the image generators is the size (64 km x 84 km) of the terrain database. These image generators and software sets required a terrain database handler to "page in" appropriate sets of the TDB into the IG system.

MWTB staff integrated the STOW-E flight format TDB into two of the three IG systems. CG^2 performed the initial integration into the systems they delivered and provided training to the MWTB staff.

The development and conversion work was done by a combination of OSF, outside vendor and MWTB resources. A master list of applicable visual models required for BCR II, existing formats and priority for BCR II was created and responsibility assigned (Appendix B). Conversion of existing files and some new models were created at the OSF. 3D models for the Grizzly and Bradley Avenger were provided by the vehicle vendors and then integrated by the MWTB staff with assistance with the OSF staff. CG^2 built the remaining models and provided them in flight format. MWTB staff completed integration into the IG software sets.

4. Conduct of The Experiment

Troops were on-site to take participate in the experiment from June 1 to June 17. The time was allocated to specific periods for troop training, pilot test, and the actual experiment and trial runs.

4.1 Troop Training

In order to get the maximum benefit from the Pilot Test, a week was set aside for troop training to bring the soldiers up to a level of confidence on the systems prior to the Pilot Test. This troop training was conducted at the MWTB from June 1 to June 6, 1998. MWTB personnel provided classroom and hands-on training consisting of familiarization and orientation on the actual simulation systems and vehicle mockups.

4.2 Pilot Test

The Pilot Test was conducted at the MWTB on June 8-9. During this time, the soldiers used the skills acquired in troop training to conduct tactical operations in a scenario specially designed to stress the systems and the soldier's skills.

4.3 Experiment and Trial Runs

The trial runs for the experiment began on June 10 and ended on June 17, 1998. A total of four trial runs were conducted and one excursion run was conducted. The experimental unit was a Task Force. Troops were provided by 3rd Battalion 66th Armor, 1st Brigade, 4th Mechanized Division and consisted of a full battalion command and staff group with company commanders, scouts, and artillery battery commander. A Brigade White Cell was provided with personnel from the TRADOC Battle Labs.

5. Observations and Lessons Learned

- **Observation #1**

Problems were encountered with Long Haul Networking (LHN) connectivity between Ft. Knox and Huntsville.

- **Discussion #1**

Various attempts were made to try and establish a data communication link between the Huntsville Army Space and Missile Defense Battle Lab and the Ft. Knox MWTB for transferring the COMPASS imagery, the coordinates needed to position the Sensor Stealth view, and the entities to be displayed in the region selected. Among the issues encountered were the following:

1) Data security issues related to using the T1 and ISDN connections. A work-around was established whereby imagery files (in JPEG format) were transferred via FTP and downloaded to the individual whiteboards about twice every hour.
2) IP address domain issues related to using the DSI connection. (ISDN requires the "199." domain) All addresses were changed to make the connection possible.

- **Lesson Learned #1**

Longhaul interface protocol and security issues need to be defined and planned well in advance of the projected need date. Preliminary integration tests of these interfaces need to be performed in advance to verify any interconnectivity issues. Sufficient time needs to be allocated for changing each machine's IP address and the associated hosts files, which reference these addresses.

- **Observation #2**

Delays were encountered associated with the late arrival of Intergraph/ CG^2 IG machines and their memory configuration.

- **Discussion #2**

Integration delays related to the CG^2 machines resulted in work–arounds to accommodate the troop training. The shortage of sufficient memory in the CG^2 machines caused sluggish performance until the memory updates were completed.

- **Lesson Learned #2**

The government must start the contract early enough to enable sufficient integration and checkout time to allow for delivery delays and configuration updates.

- **Observation #3**

Delays were encountered with model availability and texture changes.

- **Discussion #3**

Various model files were not completed in time and unavailable for checkout during system integration. Also, the initial texture files for the models contained high fidelity texturing schemes which were too large for the allocated processing times. The texture files were reconfigured at a lower fidelity level to save processing time and texture memory allocations on the individual machines.

- **Lesson Learned #3**

Whenever possible, models should be defined and delivery scheduled well in advance to allow for sufficient integration and checkout time.

- **Observation #4**

The Battle Planning and Visualization (BPV) application software was not used as part of the experiment due to interface / reliability problems. However, a backup plan was in place from the start. As a result, when the decision was made that the BPV would not be integrated, the only impact was using manpower to install the equipment.

- **Discussion #4**

The BPV application software was initially loaded and tested as part of the system integration effort. However, after many attempts to improve the performance of the S/W, it was decided that the BPV to ModSAF interface was not sufficiently robust or reliable enough to be used at this time.

- **Lesson Learned #4**

Although there is always an inherent risk involved in integration of any software application, these risks may be minimized. Possible improvements might include allocating more time

for testing and modifying the software effort earlier in the schedule and allocating more software support personnel to distribute the tasks within the schedule constraints.

6. Conclusion

The BCR II experiment accomplished it's primary goal which was to evaluate a concept which would redefine future hardware and personnel requirements to enhance the decision making capability for the Commander and his staff in the Task Force TOC of the future. The success of this initial effort has resulted in the approval and expansion for additional evaluations to further redefine these requirements. Currently two more experiments are scheduled in the next twelve months. These future experiments are currently the number one priority of the Fort Knox Battle Lab.

7. Points of Contact

ADST II BCR II Team

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STRICOM

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Customer Points of Contact

Major Joe Burns	MMBL, Ft Knox	502-942-1092

ACRONYM LIST

AAN	Army After Next
AAR	After Action Review
ADST	Advanced Distributed Simulation Technology
ARPA	Advanced Research Projects Agency
ARSI	ARPA Reconfigurable Simulator Initiative
BCR II	Battle Command Reengineering II
BCV	Battle Command Vehicle
BFV	Bradley Fighting Vehicle
BLEP	Battle Lab Experiment Plan
BLUFOR	Blue Forces
BPV	Battlefield Planning and Visualization
C2	Command and Control
C4	Command, Control, Computer and Communications
C2V	Command and Control Vehicle
CAU	Crew Access Unit
CDRL	Contract Data Requirements List
CEP	Concept Experimentation Program
CTDB	Compact Terrain Database
DACS	Digital Aural-cue / Communication System
DO	Delivery Order
DIS	Distributed Interactive Simulation
EO	Electro Optical
FRAGO	Fragmentary Order
FSCS	Future Scout Cavalry System
FSV	Future Scout Vehicle
FTP	File Transfer Protocol
GFE	Government Furnished Equipment
HHT	Hand Held Terminal
H/W	Hardware
IPT	Integrated Product Team
LAN	Local Area Network
LMC	Lockheed Martin Corporation

LMSG	Lockheed Martin Service Group
ModSAF	Modular Semi-Automated Forces
MLRS	Multiple Launched Rocket System
MMBL	Mounted Maneuver Battle Lab
MWTB	Mounted Warfare Test Bed
NGR&XUV	Next Generation Reconnaissance and Experimental Unmanned Vehicle
OC	Observer Controller
OIC	Officer in Charge
OPFOR	Opposing Forces
OPORD	Operations Order
OS	Operating System
OSF	Operational Support Facility
OTW	Out The Window
PC	Personnel Computer
PDU	Protocol Data Unit
POC	Point of Contact
PL	Platoon Leader
PSG	Platoon Sergeant
PVD	Plan View Display
RCU	Radio Control Unit
RIU	Remote Interface Unit
SA	Situation Awareness
SAF	Semi-Automated Forces
SAR	Side Aperture Radar
SC4	Surrogate Command, Control, Computers and Communication
SGI	Silicon Graphics Industries
SNE	Synthetic Natural Environment
SOV	Staff Operations Vehicle
SOW	Statement of Work
STOW-E	Synthetic Theater of War - Europe
STRICOM	(US Army) Simulation Training and Instrumentation Command
TB2VB	TRADOC Brigade and Below Virtual Battlefield
TDB	Terrain Data Base
TF	Task Force
TOC	Tactical Operations Center

TRADOC	Training and Doctrine Command
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
UDP	User Datagram Protocol
VDD	Version Description Document
WM	Wingman

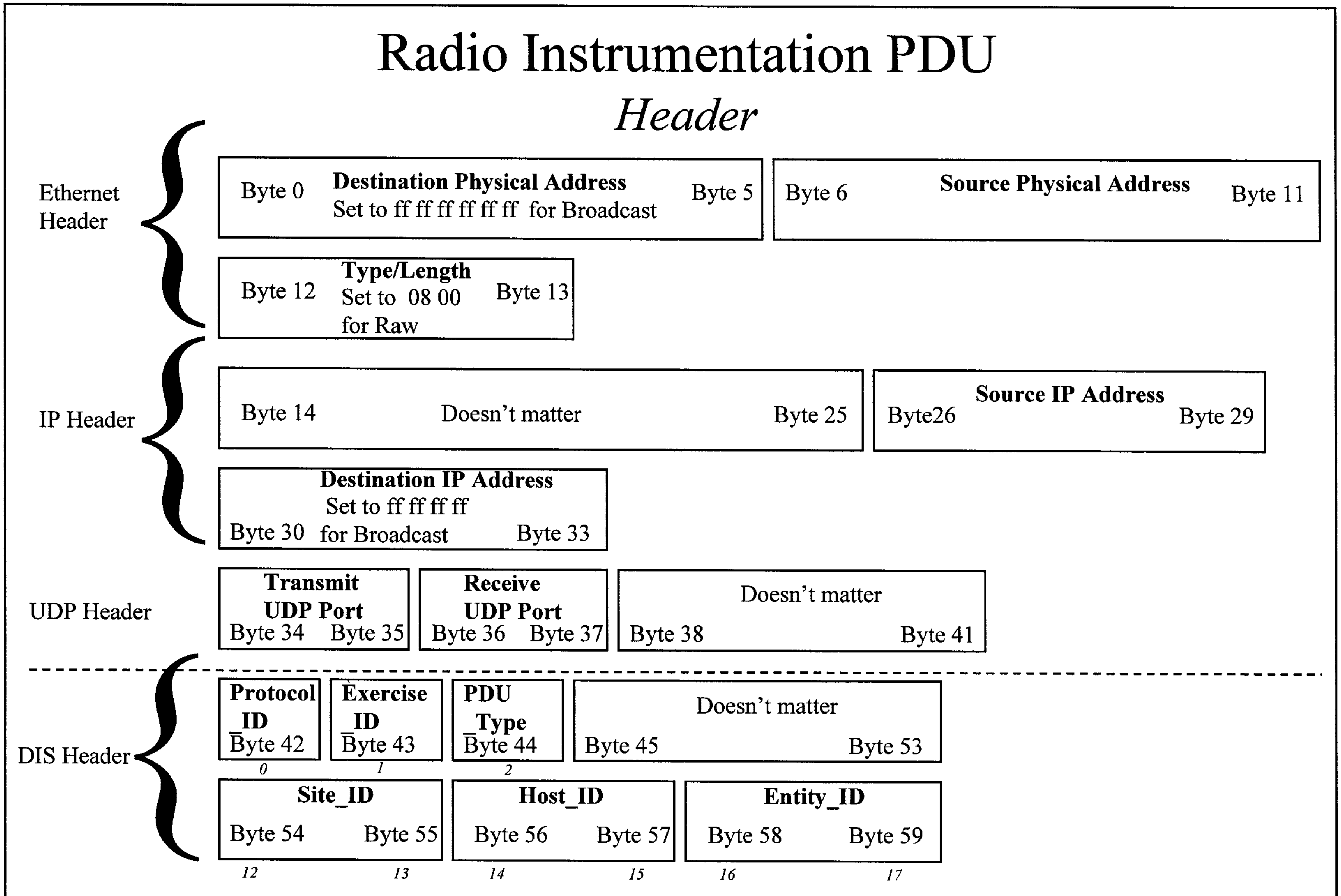

FIGURE A-1 RADIO INSTRUMENTATION PDU - HEADER LAYOUT

Radio Instrumentation PDU

Model 1 Data

1	**CAU_1 Rad RX** Byte 60	*1*	**CAU_1 Rad TX** Byte 61
2	**CAU_1 Int RX** Byte 62	*2*	**CAU_1 Int TX** Byte 63
2	**CAU_2 Rad RX** Byte 64	*2*	**CAU_ 2 Rad TX** Byte 65
2	**CAU_2 Int RX** Byte 66	*2*	**CAU_2 Int TX** Byte 67
2	**CAU_3 Rad RX** Byte 68	*2*	**CAU_ 3 Rad TX** Byte 69
2	**CAU_3 Int RX** Byte 70	*2*	**CAU_3 Int TX** Byte 71
3	**CAU_4 Rad RX** Byte 72	*3*	**CAU_ 4 Rad TX** Byte 73
3	**CAU_4 Int RX** Byte 74	*3*	**CAU_4 Int TX** Byte 75

FIGURE A-2 RADIO INSTRUMENTATION PDU - MODEL 1 DATA

Radio Instrumentation PDU

Model 2 Data

3 **CAU_1 Rad RX** Byte 80	3 **CAU_1 Rad TX** Byte 81
4 **CAU_1 Int RX** Byte 82	4 **CAU_1 Int TX** Byte 83
4 **CAU_2 Rad RX** Byte 84	4 **CAU_ 2 Rad TX** Byte 85
4 **CAU_2 Int RX** Byte 86	4 **CAU_2 Int TX** Byte 87
4 **CAU_3 Rad RX** Byte 88	4 **CAU_ 3 Rad TX** Byte 89
4 **CAU_3 Int RX** Byte 90	4 **CAU_3 Int TX** Byte 91
5 **CAU_4 Rad RX** Byte 92	5 **CAU_ 4 Rad TX** Byte 93
5 **CAU_4 Int RX** Byte 94	5 **CAU_4 Int TX** Byte 95

FIGURE A-3 RADIO INSTRUMENTATION PDU - MODEL 2 DATA

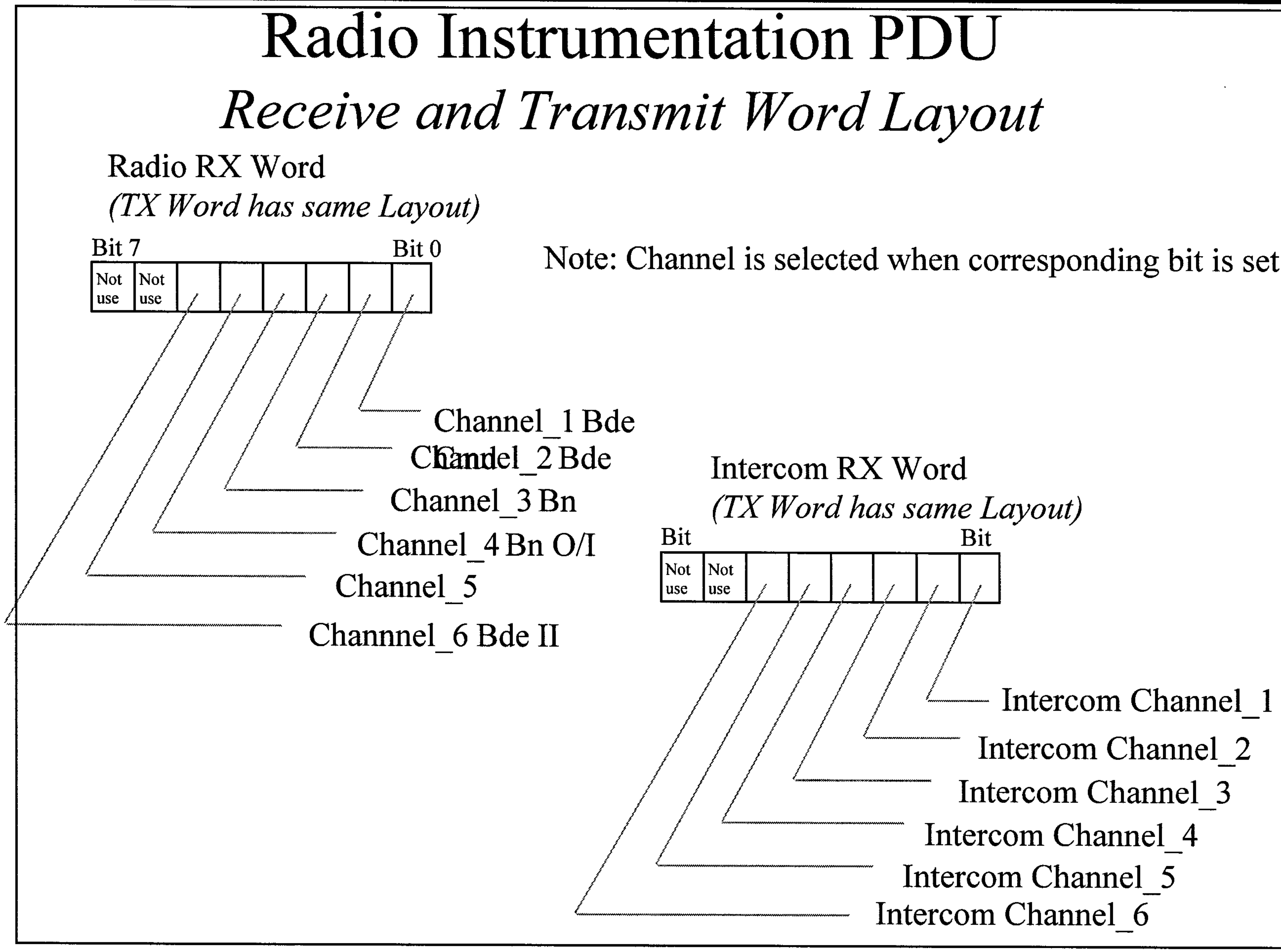

FIGURE A-4 RADIO INSTRUMENTATION PDU - RECEIVE & TRANSMIT WORD LAYOUT

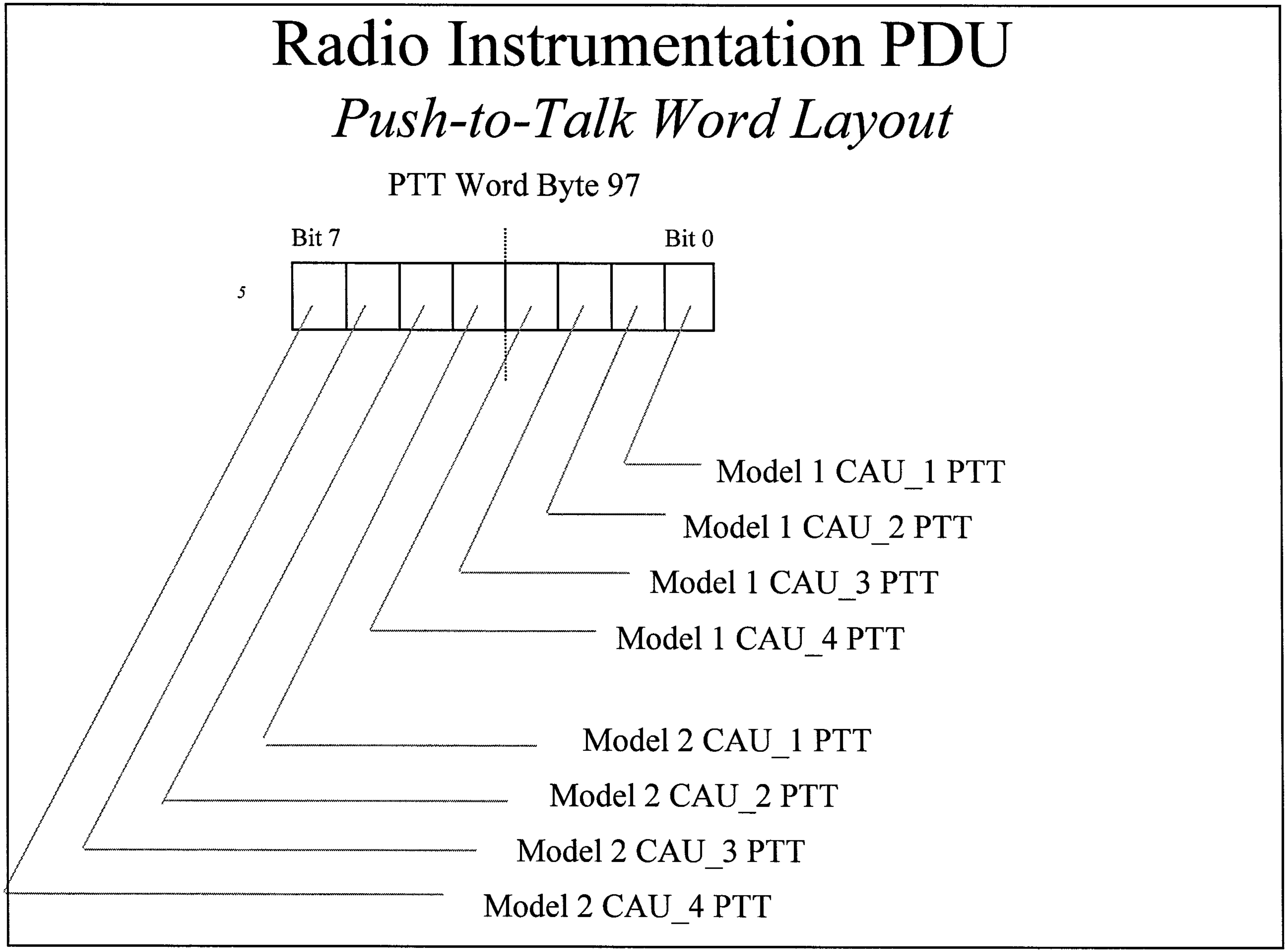

FIGURE A-5 RADIO INSTRUMENTATION PDU - PUSH-TO-TALK WORD LAYOUT

Radio Instrumentation PDU

Radio Transmit Mode Word Layout

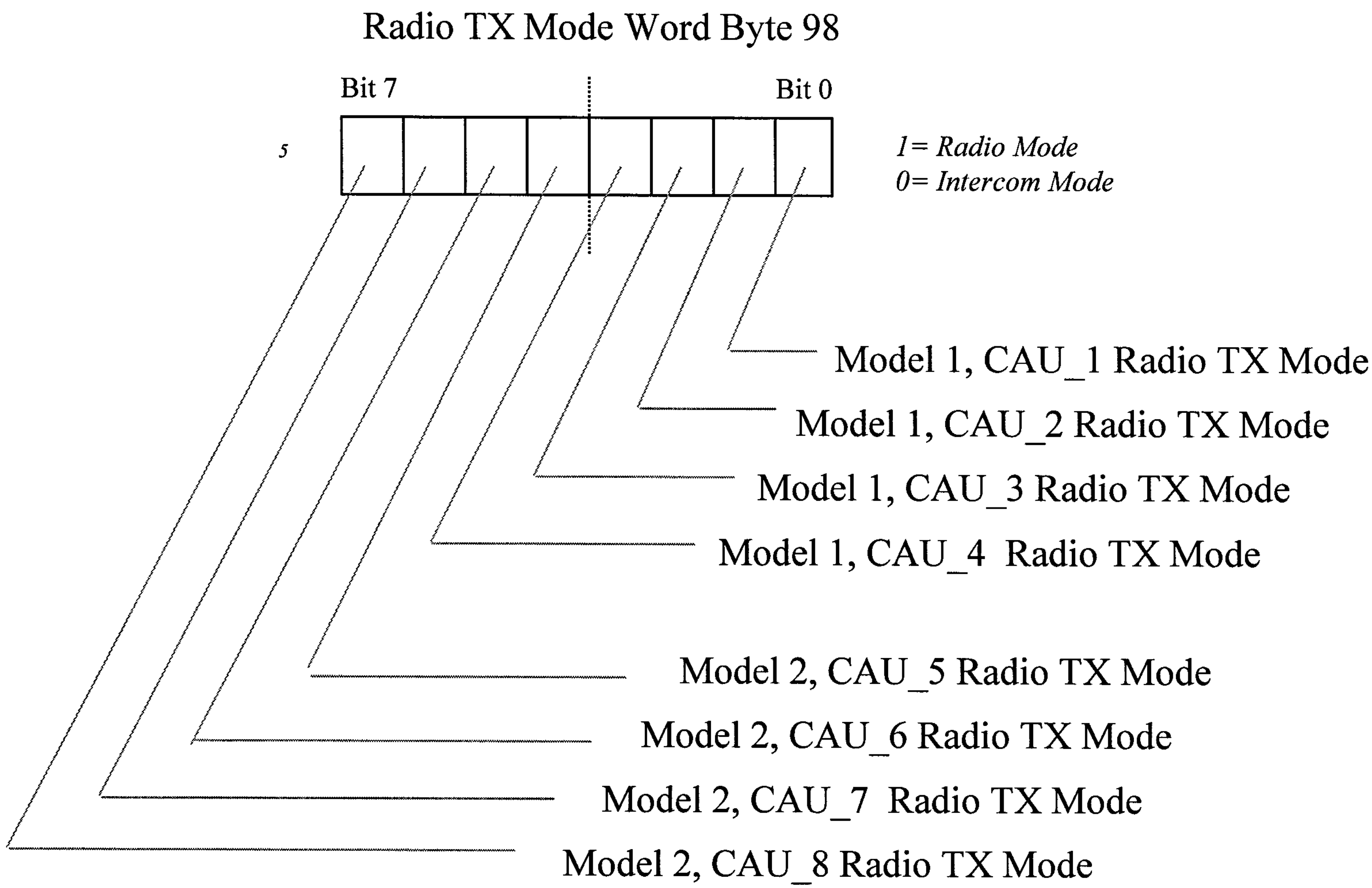

FIGURE A-6 RADIO INSTRUMENTATION PDU - RADIO TRANSMIT MODE WORD LAYOUT

BCR II ASTi Radio

DIS Radio Network

May 11, 1998

DACS#	Ref_Des	Model#	Site_ID	Host_ID	Entity_ID	DIS_ID	Default_Pos	IP-Address	UDP_Port	Config File	Model File
		cfg	mdl	mdl	mdl	cfg	mdl	cfg	cfg		
1	CO_CDRS	1	3	10	1	3:10:01	0	166.30.31.150	6994	cmd_m.cfg	cmd_mt1.mdl
2	FSCS 1	1	3	20	1	3:02:01	200	166.30.31.151	6994	fscs1_m.cfg	fscs1_mt.mdl
	Test Officer	2	3	20	2	3:02:01	400				col_g_m.mdl
3	C2V_2	1	3	30	1	3:03:01	600	166.30.31.152	6994	c2v_m.cfg	c2v2_mt1.mdl
	C2V_3	2	3	30	2	3:03:01	800				c2v3_mt1.mdl
4	ARSI #3	1	3	40	1	3:04:01	1000	166.30.31.153	6994	bde_m.cfg	fscsplmt.mdl
	BDE	2	3	40	2	3:04:01	1200				bde_mt2.mdl
5	FSO	1	3	50	1	3:50:01	1400	166.30.31.154	6994	arrow_m.cfg	arrow_m.mdl
	DAT										
6	ARSI	1	3	60	1	3:06:01	1800	166.30.31.155	6994	arsi1_mt.cfg	arsi1_mt.mdl
	BCV Table	2	3	60	2	3:06:01	2000				bcv_mt.mdl

The radios are configured for Mulaw encoding

FIGURE A-7 ASTi RADIO PARAMETERS - DIS RADIO NETWORK SETTINGS

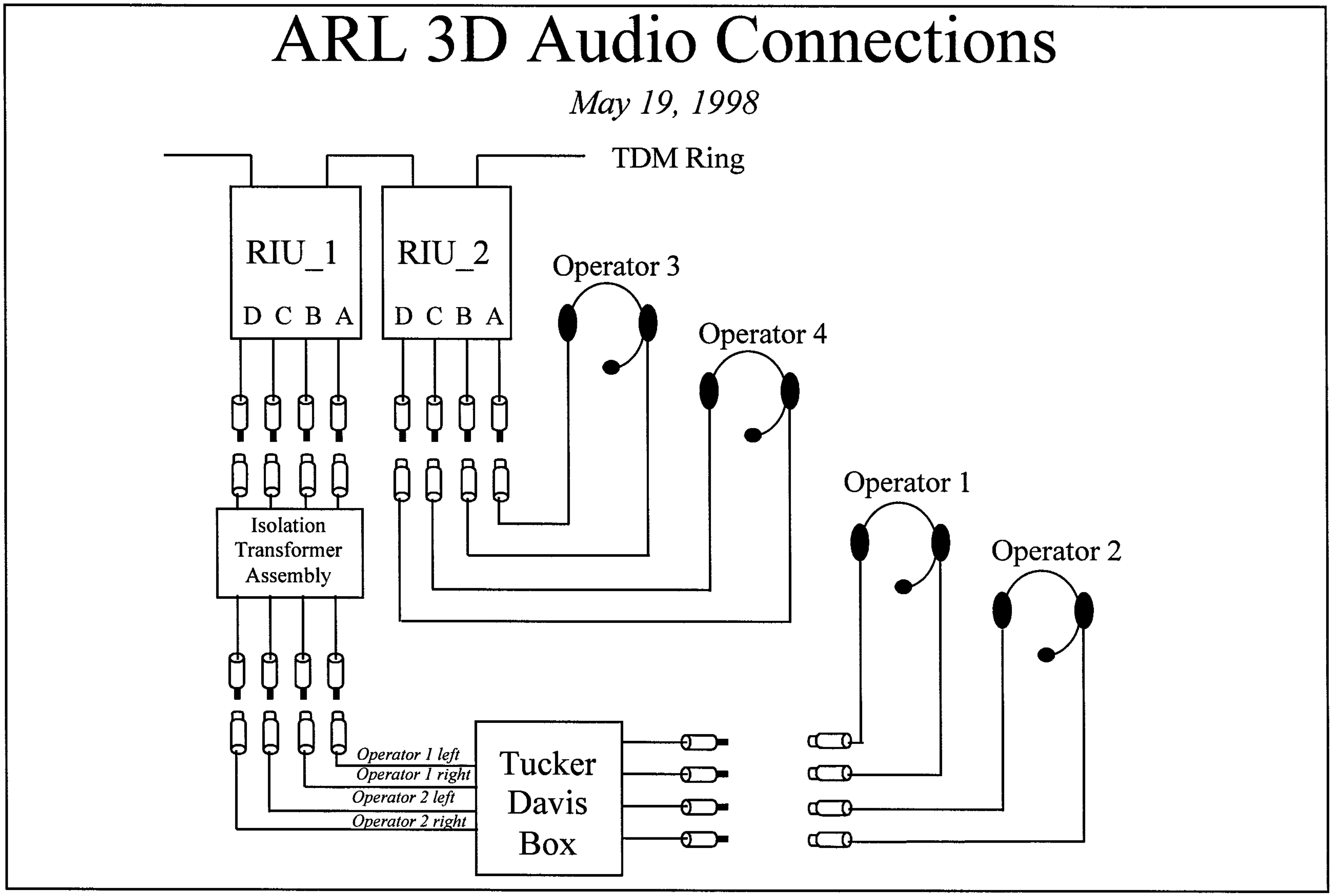

FIGURE A-8 ARL 3D AUDIO CONNECTIONS

Fort Knox TV and Observers' Audio Feeds

Five audio feeds to Ft. Knox TV will be provided.
- C2V_2 CAU_2
- C2V_3 CAU_2
- ARSI CAU_2
- Table BCV CAU_2
- FSO Gunner

Four systems will have Observers (OC)
- C2V_2 all four CAUs
- C2V_3 all four CAUs (binaural)
- ARSI all four CAUs
- Table BCV all four CAU's

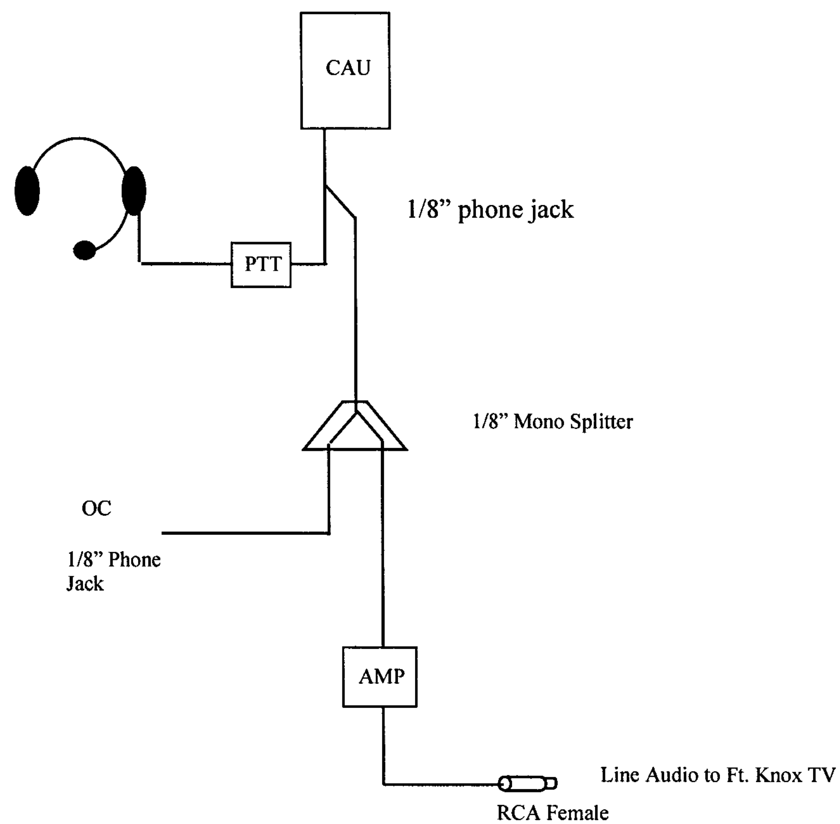

FIGURE A-9 FORT KNOX TV AND OBSERVERS' AUDIO FEEDS

APPENDIX B

Models Used for BCR II experiment:

The models used for the BCR II experiment are summarized in the following pages.

A copy of the original Excel spreadsheet file may be obtained from the ADST II configuration management group.

The original data is CM document # ADST-II-MISC-BCR-9800290 titled “BCR II Model List”.

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
2S6, Quad 30mm, 8 SA 19	C	Build it or get from CCTT			X	X	ZSU 23-4	A				CG2 works, waiting for flight translation file	CG2	Y	OPFOR COMBAT VEHICLES
BMP III - SON (Arty Recon)	C	Build it, BMP III w/o weapons and Small Fred radar on back deck					1V12 - MTLB Variant						CG2		OPFOR COMBAT VEHICLES
BMP III, 100mm, 30mm, & AT-10	A	Build it, add 100mm and stuff to BMP2						A				CG2 looks great. Waiting for woodland camo and flight format.	CG2	Y	OPFOR COMBAT VEHICLES
BMP IIIKsh, Cmd & Comm Veh	C	Build it, BMP III w/ additional antenna whips					BMP III					Low Priority for BCR	CG2	Y	OPFOR COMBAT VEHICLES
BRM (BMP3)	B	Build it, modify BMP 3					BMP 2					No 100mm and Tall Mike radar	CG2		OPFOR COMBAT VEHICLES
BTR 80Ksh, Cmd and Comm	D	Build it, BTR-80 w/additional antenna whips an 11m antenna mast					BTR 80						CG2		OPFOR COMBAT VEHICLES
BTR80 w/4 AT5	B	Build it					BRDM-2 w/4 AT 5 or BTR-80					Add LM to participate if time permits. Add AT5 rack from BRDM-2 to BTR 80 in woodland camo. Leave 14.5 mg in turret on vehicle (rack behind turret).	CG2/LM	Y	OPFOR COMBAT VEHICLES
T72G	D				X							Used for T-90	CG2	Y	OPFOR COMBAT VEHICLES
T90 w/Armor	A	Modify CG2 T72G			X		Can be substituted with T72G	A				Excellent model, waiting for flight format files	CG2	Y	OPFOR COMBAT VEHICLES
T90Ksh (C2 variant)	C	Add antennas to T-90					T-90 or T72G						CG2		OPFOR COMBAT VEHICLES

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
KA-50 Hokum	B	Build it				X	Mi-28					Lowest priority for CG2	CG2	Y	OPFOR ROTARY WING
MI-17	B	Build it										Improved MI-8, rotor on L/S	CG2	Y	OPFOR ROTARY WING
US ATGM, 2 PERS, JAVELIN & M16	B					X							CG2	Y	US PERSONNEL MODELS
US IND W/M16	B											Used as PL, SL, MGTL	CG2		US PERSONNEL MODELS
US INF FIRE TM, 4 PERS (RFLM x 2, SAW, GREN)	B												CG2	Y	US PERSONNEL MODELS
US MG TM (SAW and M16)	B												CG2		US PERSONNEL MODELS
US SCOUTS, 2 PERS, M203 AND M16 w/COMMO	B					X							CG2	Y	US PERSONNEL MODELS
US STINGER TM, 2 PERS	D					X							CG2	Y	US PERSONNEL MODELS
Battalion UAV w/Transporter	A	Use MIB-T and smaller KEN UAV (CG2)										Transport, launch recover and refuel capability. UAV complete in CG2, waiting for flight format. Double check physical size (dimensions) of the Ken UAV. Still working on the transporter. Also what happens when UAV is launched (change state or two sepa	CG2	Y	US UNMANNED VEHICLES
XUV Demo III Unmanned Ground Vehicle	A	Use CG2 variant w/WL camo	X		X			A				Mast up and down. Waiting for CG2 woodland and flight file	CG2	Y	US UNMANNED VEHICLES

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
M1078 LMTV (2.5 T)	B	Build it											CG2	Y	US VEHICLE/EQUIP MODELS
M1083 MTV (5T)	B	Build it											CG2	Y	US VEHICLE/EQUIP MODELS
M1A2, 120mm	A	CG2 to texture WL Camo			X	X	M1A1 on ARSI check camo scheme	A	A	A	A	Received version from LM. Looks good.	CG2	Y	US VEHICLE/EQUIP MODELS
Missile in a Box	A	Container done with MIB-T											CG2	Y	US VEHICLE/EQUIP MODELS
Missile in a Box Transporter	A	Modify HMMWV chassis w/MIB container										Alternate is to modify XUV chassis w/MIB container	CG2	Y	US VEHICLE/EQUIP MODELS
Staff Operations Vehicle (SOV)	A	Modify LMV FSCS - Add Wheels, remove WHEM					M4 C2V						CG2	Y	US VEHICLE/EQUIP MODELS
Trailer MTV	D	Build it											CG2		US VEHICLE/EQUIP MODELS
BM21, 122mm Rocket Launcher	C	Export S1000 to FLT	X (S)	X	X	X		A	A	A	A	LM cleaned up S1000, also has dead state. CG2 also has version. Waiting for CG2 flight format.	LM/CG2	Y	OPFOR COMBAT VEHICLES
BMP II w/AT5	D	Export S1000 to FLT or use CG2	X	X(?)	X		Fall back for BMP3	A	A	A	A	LM version looks good in flight.	CG2/LM		OPFOR COMBAT VEHICLES
M4 C2V CMD POST	C	Export S1000/use CG2	X	X	D			A				Last drop from LM has texture problems. Track texture also missing. Waiting CG2 woodland and flight format.	CG2/LM	Y	US VEHICLE/EQUIP MODELS

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
Animals	C	ARL cows in FLT						A	A	A	A	Cow works for me. Check physical dimensions of cow.	LM		CIVIL MODELS (OTW)
Cars, various types	C	Export S1000 to FLT and populate, also ARL jeep	X										LM	Y	CIVIL MODELS (OTW)
Civilian Airplanes	C	Build them											LM		CIVIL MODELS (OTW)
Civilians	C	ARL man in FLT, build them										di_eng.flt missing green_camo.rgb and duane.rgb files. Man.flt hat is off of body and missing textures I think to convert to CG2 format.	LM		CIVIL MODELS (OTW)
Trucks, commercial cargo	C	Export S1000 to FLT, color add, also ARL semi and trailer						A	A	A	A	truck.flt delivered. Like to apply some other color than green to it.	LM	Y	CIVIL MODELS (OTW)
2S19, 152mm SP Howitzer	B	Export S1000 to FLT w/WL camo	X (S)		X			A				Still unable to open LM S1000 translation. CG2 model works in CG2, waiting for flight format version from them also	LM	Y	OPFOR COMBAT VEHICLES
BTR 80, 14.5mm	D	Export S1000 to FLT, WL camo	X (S)			X	Used for BTR-80 w/AT-5						LM	Y	OPFOR COMBAT VEHICLES
ZSU 23-4	D	Export to FLT	X	X			For 2S6						LM		OPFOR COMBAT VEHICLES
OPFOR ATGM Team, 3 Pers	A												LM	Y	OPFOR DISMOUNTED FORCES
OPFOR Dismt Eng Element, 10 Pers	C					X							LM	Y	OPFOR DISMOUNTED FORCES

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
MI-28 Havoc	B	Export to S1000	X				Used for KA 50					Change priority, need conversion from S1000	LM		OPFOR ROTARY WING
UAV at REGIMENT	B	Use Pioneer	X	X				A	A	A	A	uav.flt is smaller pioneer. LM delivered.	LM	Y	OPFOR UNMANNED VEHICLES
F16 FALCON	E	Export S1000	X	X	D	X							LM	Y	US FIXED WING
RAH 66 COMANCHE	B	Export S1000 to FLT and populate	X	X			Apache Longbow AH64D	A	A	A	A	LM model delivered.	LM	Y	US ROTARY WING MODELS
M109A6 SP HOW	C			X	D							Received dead version from LM. Both live and dead flight files are actually dead vehicle.	LM	Y	US VEHICLE/EQUIP MODELS
M113A3, CARR PERS	E	Export S1000	X	X		X		A				CG2 has working model. Waiting for woodland and flight format.	LM	Y	US VEHICLE/EQUIP MODELS
M88A2 ARMD RCVY VEH	E	Export S1000 M88A1											LM	Y	US VEHICLE/EQUIP MODELS
M93 NBC RECON VEHICLE	E	Check ARSI "Fox"		X								Low priority for BCR 2. Have texture mapping problem, have all the right files, black and white model.	LM	Y	US VEHICLE/EQUIP MODELS
MPQ 53 PATRIOT RADAR (MODSAF 1.0)	E	Export S1000/use CG2	X		X							Low priority for BCR II	LM	Y	US VEHICLE/EQUIP MODELS
2S23, Combination Gun mtd in BTR-80	B	Take BTR and add 2S9 Turret	X				2S31	A	A	A	A	LM completed. Fixed latest version texture file lost/overwritten.	LM/CG2		OPFOR COMBAT VEHICLES

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
2S31, Combination Gun mtd in BMP	B	Take BMP2 and add 2S9 Turret	X				2S23	A	A	A	A	LM completed. Need to have texture file of BMP chassis match that of turret.	LM/CG2	Y	OPFOR COMBAT VEHICLES
BDRM 2, ATGM, w/4 AT5	C	Add AT 5 rack			X (no AT5)	X	Alternate to BTR 80 w/AT5	A	A	A	A	LM version ok with exception of left rear tire. Texture polygon odd shape, leaves goofy looking tire. Same is true in dead model.	LM/CG2	Y	OPFOR COMBAT VEHICLES
BRDM 2, RECON, 14.5 mm & 7.62 mm MG	D			X			Used for BTR-80 w/AT-5						LM/CG2	Y	OPFOR COMBAT VEHICLES
OPFOR Dismounted Element, 7 Pers, MG & RPG	B					X							LM/CG2	Y	OPFOR DISMOUNTED FORCES
OPFOR Dismounted Infantry	B												LM/CG2	Y	OPFOR DISMOUNTED FORCES
OPFOR Dismt ADA Wpn, 2 Pers	B												LM/CG2	Y	OPFOR DISMOUNTED FORCES
OPFOR Dismt Scouts, 3 Pers, Wpn	B					X							LM/CG2	Y	OPFOR DISMOUNTED FORCES
OPFOR SA 7, Dismounted Infantry AD Weapon	B					X							LM/CG2	Y	OPFOR DISMOUNTED FORCES
AH64 APACHE - LongBow	D	Both formats available, used only if RAH66 doesn't work	X		D	X							LM/CG2	Y	US ROTARY WING MODELS
Micro Aerial Vehicle	B	Use either S1000 or smaller KEN UAV (CG2)	X					A	A	A	A	LM delivered. Looks ok. If time permits, remove the three landing leg bars.	LM/CG2	Y	US UNMANNED VEHICLES

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
HMMWV W/AVENGER	C		X	X?	D		Used in place of Bradley Avenger	A	A	A	A	LM model complete. HMMWV body darker than Avenger part, but not a warstopper	LM/CG2	Y	US VEHICLE/EQUIP MODELS
M270 MLRS	C	Check for WL camo on S1000, otherwise done	X (S)		D	X	None	A	A	A	A	LM model complete. Will compare with CG2 if delivered.	LM/CG2	Y	US VEHICLE/EQUIP MODELS
M901 PATRIOT MISSILE LAUNCHER (MODSAF 1.0)	E	Export S1000	X									Low priority for BCR II	LM/CG2	Y	US VEHICLE/EQUIP MODELS
M978, HEMTT, FS	B	Build it	X	X		X	Use existing dorky model	A	A	A	A	LM delivered improved model, waiting for CG2 w/woodland camo	LM/CG2	Y	US VEHICLE/EQUIP MODELS
M985 HEMTT, CARGO	B	Build it				X	Use existing dorky model	A	A	A	A	LM delivered improved model, waiting for CG2 w/woodland camo	LM/CG2	Y	US VEHICLE/EQUIP MODELS
M998, HMMWV (Stinger Tms & 1SG)	E	Export S1000/use CG2											LM/CG2	Y	US VEHICLE/EQUIP MODELS
Bradley Linebacker	B	Check ARSI M2 Stinger model, if no go, only option is build it	X		X		Can be substituted with HMMWV Avenger	A	A	A	A	Both CG2 and LM have models, both work. CG2 still in desert camo, still waiting for flight format.	LM/MMBL	Y	US VEHICLE/EQUIP MODELS
Crusader	B	Have it built					Can be substituted with M109A6					UDLP did not provide (not available) will ask CG2 to look at as low priority.	LM/MMBL	Y	US VEHICLE/EQUIP MODELS
Crusader Ammo Spt Veh	B	Have it built					Can be substituted with M992 FAASV					UDLP did not provide (not available) will ask CG2 to look at as low priority.	LM/MMBL		US VEHICLE/EQUIP MODELS
M2A3 BFVS	A	Use CG2 M2A2 to flight format			D		Can be substitued with M2A2 or other variants	A	A	A	A	Received from UDLP, in flight format working well.	LM/MMBL	Y	US VEHICLE/EQUIP MODELS

PLATFORMS	BCR PRIORITY	SOLUTION	M1A2 & ONYX Stealth	ARSI Stealth	CG2 Stealth	CCTT STEALTH & SAF	REPLACEMENT OPTIONS	AVAILABLE & TESTED				NOTES	Lead Agency	Required for BCR II	CLASSIFICATION
								CG2	LMV	METAVR	ARSI				
XM GRIZZLEY	C	Export S1000 to FLT, modify to WL camo	X (S)					A	A	A	A	Done and in good woodland camo. May need to thin out number of polygons.	LM/MMBL	Y	US VEHICLE/EQUIP MODELS
FSCS XM-X	A	Use LMV variant w/WL camo	X					A	A	A	A	LMV will deliver WL camo, still waiting. Need LM/ADST II to texture existing S1000 model and put in woodland camo.	LMV/LM	Y	US VEHICLE/EQUIP MODELS
1V12, MT-LB Variant	D	Do without			X		Take missile off of SA13 TEL	A				Fallback for BMP-SON, CG2 works, waiting for flight translation file	None	Y	OPFOR COMBAT VEHICLES
AN/TPQ 36 FF RADAR	D	Unless we stumble onto something, won't occur										Either 36 or 37 for BCR, Low priority in either case	None	Y	US VEHICLE/EQUIP MODELS
AN/TPQ 37 FF RADAR	D												None	Y	US VEHICLE/EQUIP MODELS
M1079 LMTV VAN	F	Not going to happen										Low priority for BCR II	None	Y	US VEHICLE/EQUIP MODELS
M1089 MTV WRECKER	F	Not going to happen											None	Y	US VEHICLE/EQUIP MODELS
M1091 MTV (5T)	F	Not going to happen											None	Y	US VEHICLE/EQUIP MODELS
M984E1, HEMTT WRECKER	F	Not going to happen				X						Low priority for BCR II	None	Y	US VEHICLE/EQUIP MODELS
M992 FAASV	D	Build it										Alternate to Crusader Support Vehicle	None	Y	US VEHICLE/EQUIP MODELS